(P.O. 3/12/02)
in time

(12) UK Patent Application (19) GB (11) 2 144 082 A

(43) Application published 27 Feb 1985

(21) Application No 8419095

(22) Date of filing 26 Jul 1984

(30) Priority data
(31) 58/138230 (32) 27 Jul 1983 (33) JP
58/138231 27 Jul 1983
58/138232 27 Jul 1983

(51) INT CL³
B41J 3/20

(52) Domestic classification
B6F L8

(56) Documents cited
GB 1473870 EP 0076892 US 4039065
GB 1436036 EP 0055051

(58) Field of search
B6F

(71) Applicant
Sharp Kabushiki Kaisha (Japan),
22–22 Nagaike-cho, Abeno-ku, Osaka 545, Japan

(72) Inventors
Hiroo Katsura
Keiji Yao
Kazuya Koyama

(74) Agent and/or Address for Service
R G C Jenkins & Co,
12–15 Fetter Lane, London EC4A 1PL

(54) Thermal printers

(57) A thermal recording apparatus for recording onto a recording paper comprises a printing head 1, an ink ribbon member, and movement means e.g. a cam 12 for moving the printing head between a first position in which the printing head is in contact with the recording paper via the ink ribbon member and a second position in which the printing head is not in contact with the recording paper.

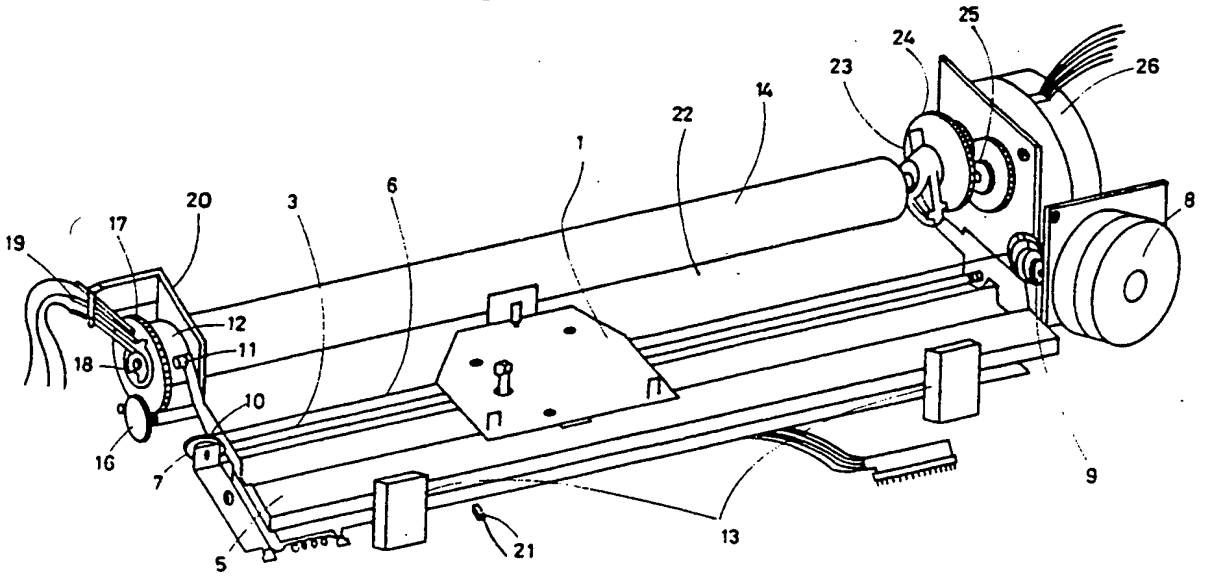

FIG.1.

GB 2 144 082 A

2144082

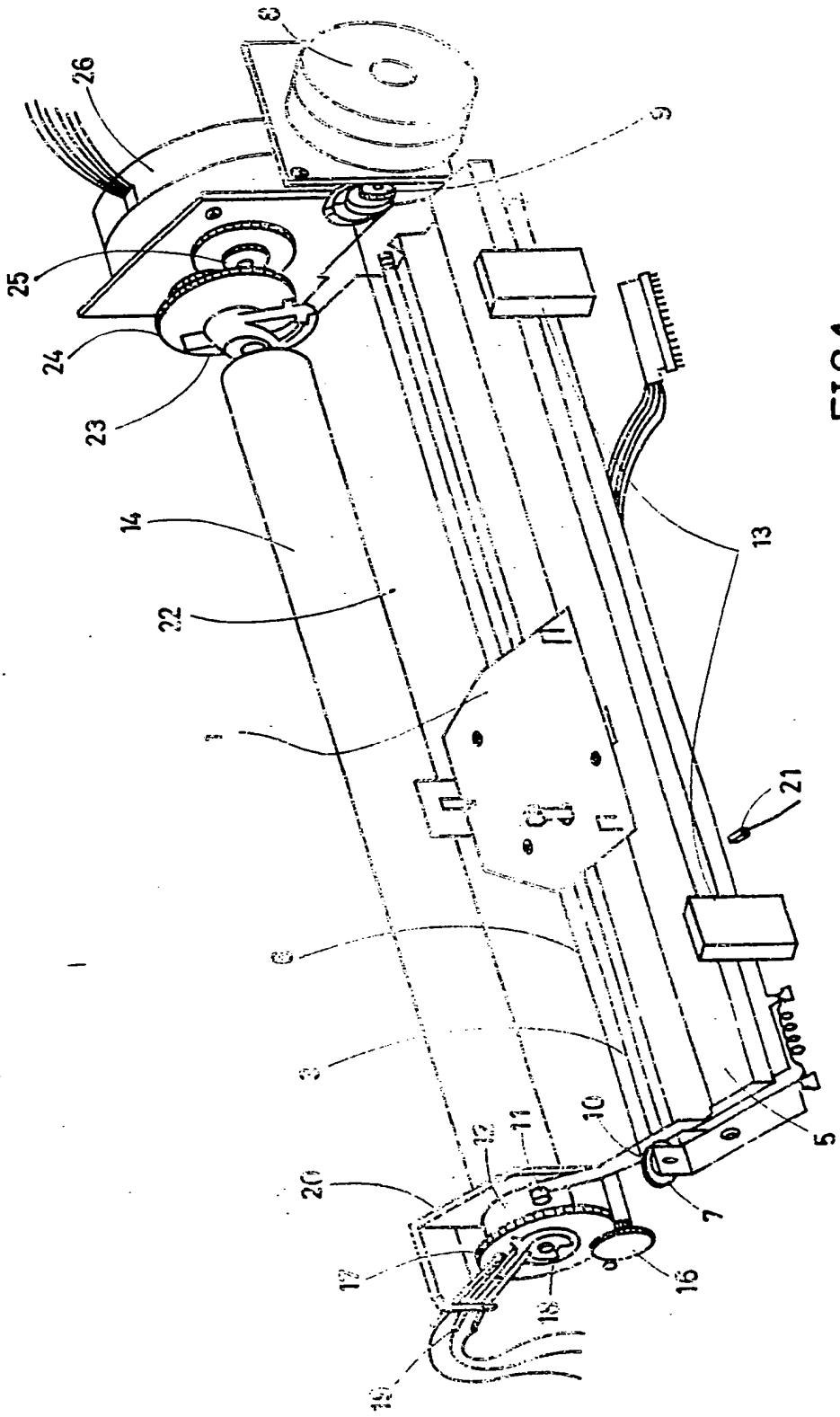

FIG.1

2144082

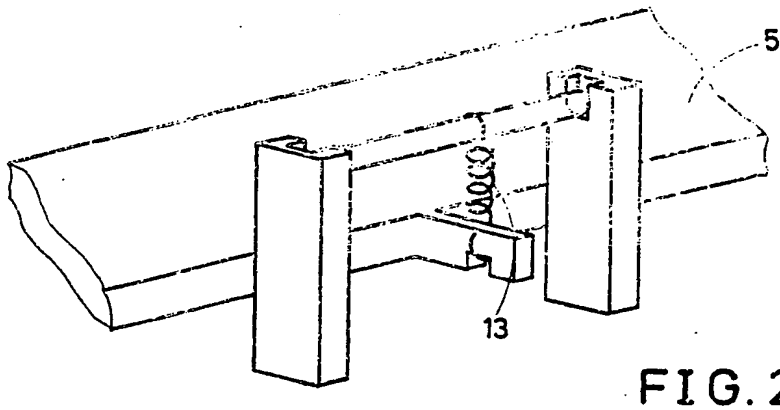

FIG. 2

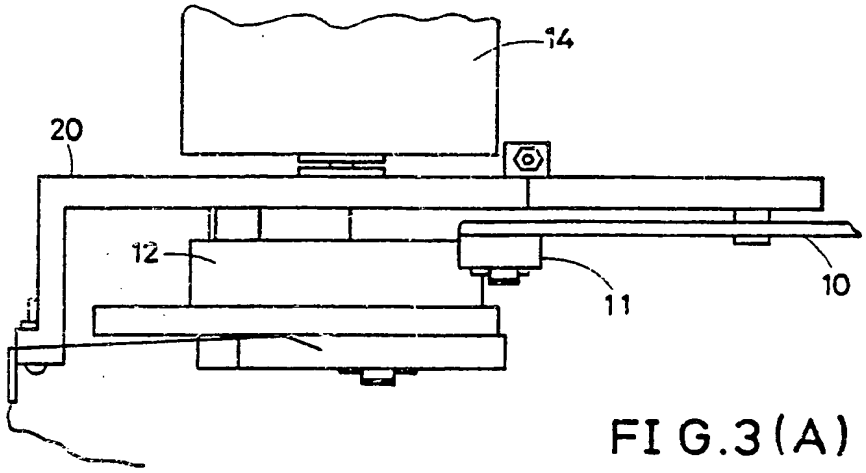

FIG.3(A)

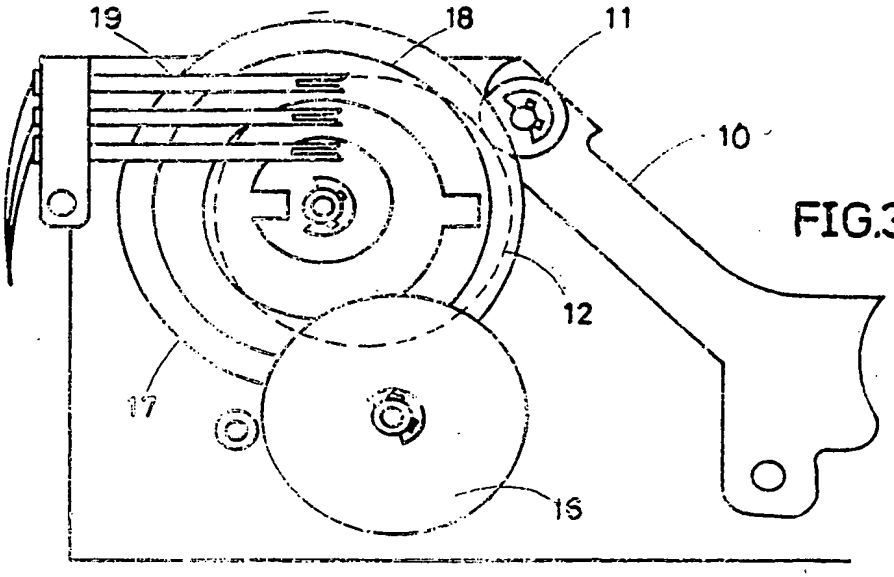

FIG.3(B)

2144082

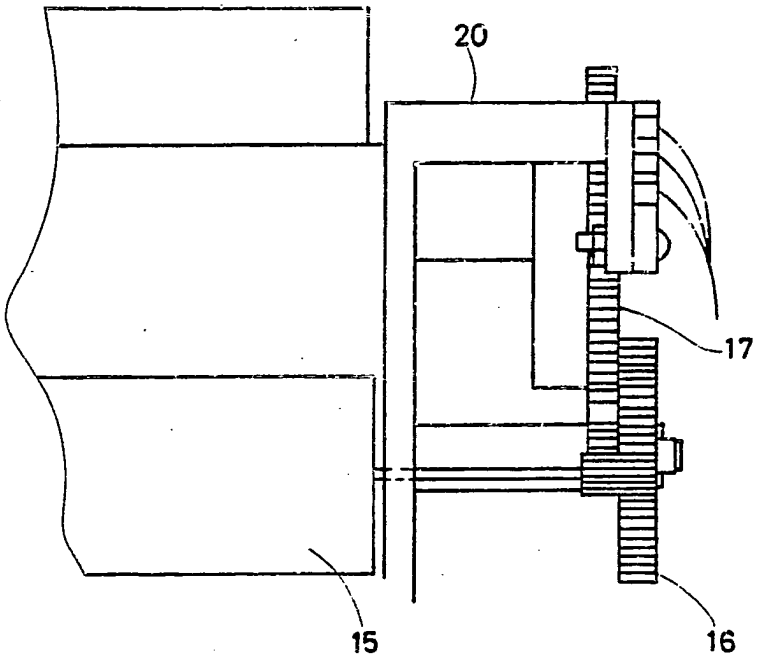

FIG.3(C)

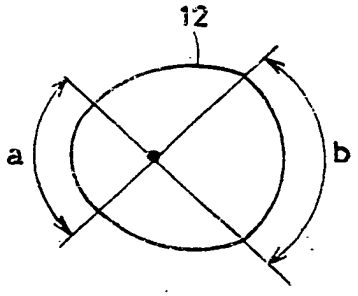

FIG.4

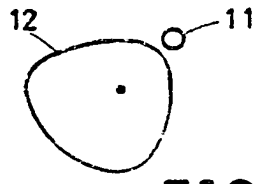

FIG.5(A)

FIG.5(B)

2144082

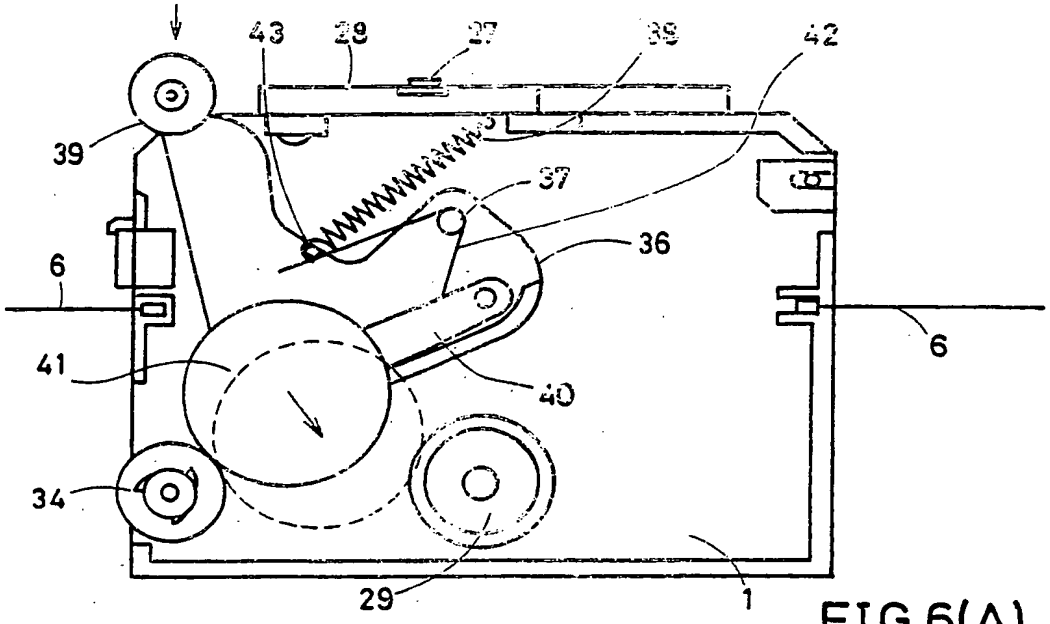

FIG.6(A)

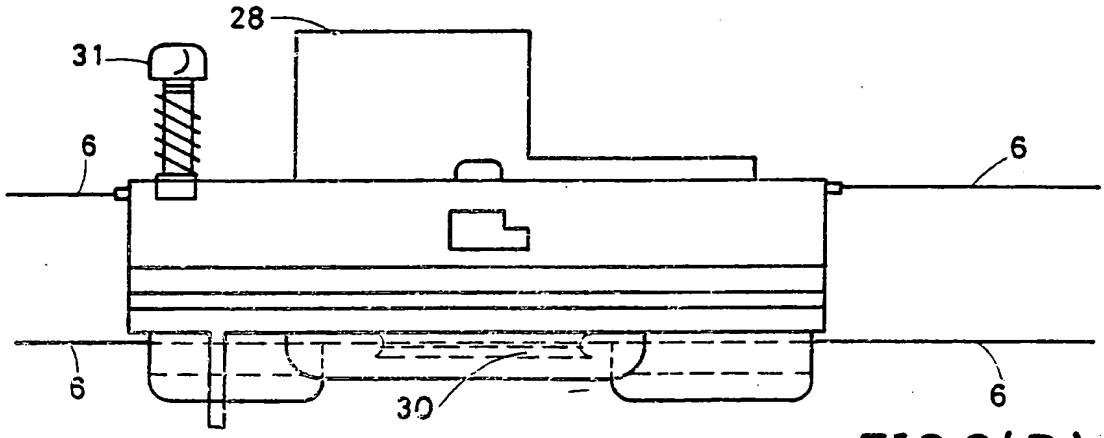

FIG.6(B)

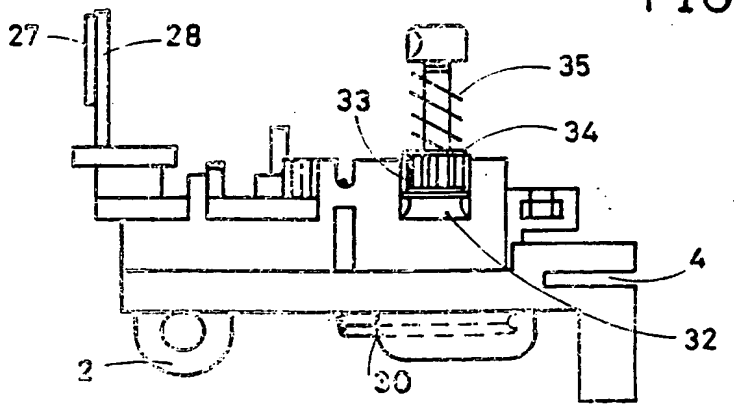

FIG.6(C)

SPECIFICATION

Recording apparatus

BACKGROUND OF THE INVENTION

The present invention relates to a recording apparatus and, more particularly, to an improved recording apparatus of the non-impact type which uses a thermal head member.

In the conventional thermal transfer printer having the thermal head member, the ink ribbon member coated by a thermomelting ink material is disposed over the recording paper, and the thermal head member is heated with the desired positions to become in contact with the ink ribbon member so as to record the desired pattern information on the recording paper by melting the ink material of the ink ribbon member.

However, when the desired perttern information is recorded on the recording paper, the thermal head member heated with the desired positions transfers the ink material from the ink ribbon member to the recording paper by being attached so much closely, so that the ink ribbon member and the recording paper may be cutted off or broken when the thermal head member is released from the recording paper via the ink ribbon member.

Also, because the movement responsive to the recording paper of the thermal head of the recording apparatus is controlled by the solenoid and the crank mechanism, the noise and power-loss are too much high, and further, the thermal head may be broken since the thermal head hits hard onto the recording paper via the ink ribbon member.

Further, the ink ribbon member is rolled up by using the rack and the pinion gear when the carriage carrying the ink ribbon member is horizontally slided for printing the desired information onto the recording paper, so that the noise is loudly generated.

SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to provide a compact and noiseless recording apparatus with a low power.

It is another object of the present invention to provide an improved recording apparatus in which a printing head such as a thermal head attaches soft to the recording paper via an ink ribbon member so as to record the desired pattern information on a recording paper.

It is still another object of the present invention to provide an improved recording apparatus including a compact ink ribbon reeling mechanism which drives a reel axis of an ink ribbon cassette carrying an ink ribbon for recording with a driving wire of a carriage carrying the ink ribbon cassette.

It is a further object of the present invention to provide an improved recording apparatus which can release an ink ribbon from the recording paper with a small draw power after recording the desired pattern information.

It is still further object of the present invention to provide an improved recording apparatus of the non-impact type which can be easily separate each of a printing head, an ink ribbon member, and a recording paper after the recording of the desired pattern information is completed by attaching closely between the recording paper and the printing head via the ink ribbon member.

Other objects and further scope of applicability of the present invention will become apparent from the detailed description given hereinafter. It should be understood, however, that the detailed description of and specific examples, while indicating preferred embodiments of the invention, are given by way of illustration only, since various changes and modifications within the spirit and scope of the invention will become apparent to those skilled in the art from this detailed description.

According to an embodiment of the present invention, a thermal recording apparatus for recording onto a recording paper comprises a printing head, an ink ribbon member, and movement means for moving the printing head between a first position in which the printing head is in contact with the recording paper via the ink ribbon member and a second position in which the printing head is not in contact with the recording paper.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be better understood from the detailed description given hereinbelow and the accompanying drawings which are given by way of illustration only, and thus are not limitative of the present invention and wherein:

Figure 1 shows a perspective view of a recording apparatus according to an embodiment of the present invention;

Figure 2 shows a view of a detailed construction including a spring 13 and a carriage guide plate 5;

Figures 3(A)–3(C) are a plan view, a front view, and a side view of a peripheral mechanism around a cam 12, respectively;

Figure 4 is a shape of the cam 12;

Figures 5(A)–5(B) are views of explaining relative positions of a cam and a printing head; and

Figures 6(A)–6(C) are a plan view, a front view, and a side view of a carriage for use in the recording apparatus of Fig. 1.

DETAILED DESCRIPTION OF THE INVENTION

Fig. 1 shows a perspective view of a recording apparatus such as a thermal transfer printer according to an embodiment of the present invention.

A carriage 1 carries a thermal head member and an ink ribbon cassette including an ink ribbon member coated by a thermomelting

material. A guide plate 2 (Fig. 6(C)) having an opening is provided at the front and bottom position of the carriage 1. A carriage guide shaft 3 is inserted into the opening of the guide plate 2, so that the carriage 1 is horizontally slided along the carriage guide shaft 3. A groove 4 (Fig. 6(C)) is provided at the back position of the carriage 1, so that one end of a carriage guide plate 5 is inserted into the groove 4 of the carriage 1 for holizontally sliding the carriage 1.

Both ends of a wire 6 for moving the carriage are coupled to the carriage 1, and the wire 6 is extended between a spring-tentioned pulley 7 and a pulley of a carriage driving gear 9 which is driven by a carriage feed motor 8, so that the wire 6 is looped.

The wire 6 is moved in the horizontal direction by driving the motor 8. Further, the wire 6 is rolled by one turn around a pulley 30 (Fig. 6(B)), provided at the bottom position of the carriage 1, for supporting the driving of the ink ribbon reel axis.

An arm member 10 is integrally formed with the carriage guide plate 5. A roller 11 is provided at one end of the arm member 10, and the roller 11 is in contact around the surface of a cam 12 as described later. The roller 11 is moved along the cam surface of the cam 12 by lifting up in the upper direction the front position of the carriage guide plate 5 with a spring 13 as shown in Fig. 2. The position of the thermal head provided on the carriage 1 is controlled against the platen 14 by the combination of the cam 12 and the arm member 10, so that the carriage 1 is seesawed with a fulcrum of the shaft 3 in conformance with the shape of the cam 12 and the thermal head is moved in the up and down directions.

The cam 12 is coupled with a gear 17 in the common axis, and the cam 17 is engaged with a gear 16 provided around the rotating axis of a DC motor 15. The cam 12 is rotated with the gear 17. A base 18 is provided on the side surface of the gear 17, and electric conductive patterns for detecting the up and down positions of the thermal head are formed on the surface of the base 18. Three terminals 19 are in contact with the electric conductive patterns so as to take out ON/OFF signals for the DC motor 15, and the three terminals 19 are secured to a "L" shape angle 20.

A detector 21 is operated to detect the positioning of the carriage 1 at its home position (original position). A pinch roller acceptor is designated by 22. and a nob 23 is operated to cancel the seesaw up operation of the thermal head and the operation of the pinch roller.

A gear 24 is provided around the rotating axis of the platen 14 and rotated by the power of a paper feed motor 26 via a gear 25. The gear 24 can be used as a manual paper feed gear.

The cam 12 and its pheripheral mechanisms will be described as follows with reference to Figs. 3(A)–3(C), 4, and 5(A)–5(B). The shape of the cam 12 is shown in Fig. 4.

The cam 12 has an area *a* with a minimum radius and an area *b* with a maximam radius, and the areas *a* and *b* are formed as widely as possible. The length of each of the radiuses is selected to be harmony with the mechanism of the recording apparatus.

Now, when a signal indicating a print timing is applied, the DC motor 15 is driven, and the cam 12 is rotated. When the terminals 19 detect a signal for a head-down operation, the DC motor 15 is stopped driving. In this time, the roller 11 of the arm 10 is positioned at the area *a* of the cam 12. The arm 10 is rotated in the unclockwise direction of Fig. 3(B). The front position of the carriage guide plate 5 is lifted up by rotating the arm 10. The carriage 1 is rotated around the carriage guide shaft 3 in the direction of the platen 14, so that the thermal head on the carriage 1 is attached to the recording paper on the platen 14 via the ink ribbon member coated by the thermomelting ink material, and the desired pattern information is printed out on the recording paper by heating the desired positions of the thermal head.

When the desired pattern information is recorded, the roller 11 and the cam 12 are slightly spaced as shown in Fig. 5(A), so that the thermal head is uniformly in contact with the recording paper by the spring 13.

After the recording of one line by moving the carriage 1 in the right direction has been completed in the above manner, a printing completion signal is applied for redriving the DC motor 15. The three terminals 19 detect a signal generated for a head-up operation, and then, the DC motor 8 is stopped driving. In this time, the roller 11 is positioned at the area *b* of the cam 12 as shown in Fig. 5(B), so that the arm 10 is rotated in the clockwise direction so as to release the thermal head of the carriage 1 from the platen 14 and the recording paper. The head-up operation is carried out and the thermal head is placed in the up position. When the thermal head is in the head-up position, the carriage carrying the thermal head is returned in the original (home) position.

As described above, the head up/down movements are carried out by the cam 12 and the DC motor 15 for driving the cam 12, so that the noise is smaller than that generated by the solenoid which is used in the conventional printer and the thermal head attaches soft to the recording paper on the platen 14 so as to prevent any damage of the thermal head.

Generally, when a temperature or a load is changed, the motor is slipped from the correct stop position. Accordingly, the motor 15 must

be compulsorily stopped so as to stop the cam 12 in the correct stop position.

According to the present invention, the areas *a* and *b* of the cam 12 are formed widely in order to reduce the slip from the correct stop position of the motor 15. The over-run from the correct stop position of the motor 15 is absorbed by the area *a* or *b* of the cam 12. The mechanism which uses the cam 12 can be simplified than the mechanism which uses the solenoid or the like, and can be controlled with high reliability.

Figs. 6(A)–6(C) are a plan view, a front view, and a side view of a carriage used in the printer according to the present invention, respectively.

The thermal head is designated by 27, and a heat radiation plate is designated by 28. A gear 29 is rotatably provided on the bottonm position of the carriage 1. The gear 29 is connected to a pulley 30 via the botton plate so as to rotate the gear 29 and the pulley 30 at the same time. The wire 6 is rolled by one turn around the pulley 30 as shown in Fig. 6(B). When the wire 6 is pulled, the carriage 1 is slided in the horizontally direction, and the pulley 30 is rotated.

When the ink ribbon cassette carrying the ink ribbon member is set into the carriage 1, the ribbon reel axis 31 is inserted into the reel bobbin of the ink ribbon cassette. The ribbon reel axis 31 is rotatably provided at the bottom plate of the carriage 1.

A seat 32 is integrally formed at the bottom portion of the ribbon reel axis 31, and a felt 32 and a gear 34 are inserted into the ribbon reel axis 31 on the seat 32.

The felt 33 and the gear 34 are pressed by a coil spring 35 in the direction of the seat 32. Accordingly, when the gear 34 is rotated, the ribbon reel axis 31 is rotated by friction. When a load agaist the ribbon reel axis 31 is larger than a predetermined value, only the gear 34 is rotated by slipping. An "L" shape movable plate 36 is provided on the botton plate of the carriage 1 and freely rotated around an axis 37. A part of the movable plate 36 provided with a roller 39 is usually projected in the front of the thermal head 27.

One end of a movable bar 40 is rotatably attached to the "L" shape movable plate 36, and the other end of the movable bar 40 has a rotatable gear 41. The movable bar 40 is forced till a stopper 43 of the movable plate 36 in the unclockwise direction by the spring 42.

The gear 41 is usually separated from the gears 29 and 34. When the roller 39 of the "L" shape movable plate 36 is pressed in the direction of arrow, the gear 41 is positioned so as to engage with the gears 29 and 34 at the same time.

When the gear 41 is returned to the home position by a coil spring 38, the gear 34 is rotated, so that gear 41 is supported a little by friction so as to rotate slightly the ribbon reel axis 31 in the reel direction.

Now, when the carriage 1 is driven down by applying a signal for printing, the roller 39 is in contact with the pinch roller acceptor 22 and is pressed in the arrow direction, and then, the "L" shape movable plate 36 and the movalble bar 40 are rotated in the unclockwise direction. The gear 41 provided with the movable bar 40 is engaged with the gears 29 and 34. In this condition, the desired pattern information is recorded onto the recording paper by heating the desired positions of the thermal head. By rotating the carriage feed motor 8, the upper positioned wire 6 is pulled in the right direction and the carriage 1 is slided. As shown in Fig. 6(B), the wire 6 of the lower position is moved in the left direction. The pulley 30 is rotated, and the rotation of the pulley 30 is transmitted to the gear 34 via the gears 29 and 41. Therfore, the ribbon reel axis 31 engaged frictionaly with the gear 34 is rotated in the reel direction, and finnaly, the ink ribbon of the ink ribbon cassette is reeled every each time the carriage 1 is moved in the right direction for printing. The printing of one line is completed as described above.

When the printing of one line is completed, the printing completion signal is applied and the carriage 1 is seesawed with the fulcrum of the shaft 3 in conformance with the shape of the cam 12 and the thermal head is released from the recording paper via the ink ribbon member, so that the head is raised. The roller 39 is moved in the revirse direction of arrow by the coil spring 38. The gear 41 is released from the gears 29 and 34 and returned to the original (home) position. In this time, although the pulley 30 is rotated, the ribbon reel axis 34 is not rotated because the gear 41 is released from the gear 29 connected the pulley 30.

The ink ribbon member in the ribbon cassette is reeled by the wire 6 for moving the carriage in the horizontal direction.

When the thermal head is raised, the gear 34 is slightly rotated by the movement for returning of the gear 41, and the ribbon reel axis 31 is rotated in the ribbon reel direction, so that the ribbon member attached strongly to the recording paper by heating and melting the thermomelting ink material can be easily stripped from the recording paper.

The roller 39 is sufficiently pressed by the operation of the movable bar 40 even when the gear 41 is engaged with the gears 29 and 34, so that the thermal head is correctly and closely attached to the recording paper without the space.

According to the present invention, the ink ribbon reel axis is driven to rotate by the movement of the driving wire of the carriage. Also, the recording apparatus has the cam, the motor for driving motor the cam, and the

mechanism for releasing the carriage from the recording paper responsive to the shape of the cam. Further, as soon as the carriage carrying the ink ribbon member is returned to the home position, the ribbon reel axis is further slightly rotated in the ribbon reel direction, so that the ink ribbon can be separated from the recording paper with a smaller pull power.

According to the gist of the presetn invention, it may not be essential that the carriage is seesawed to move the head. It may be possible that the carriage is relatively moved close to and apart from the recording paper while carrying the head and the ribbon member.

The invention being thus described, it will be obvious that the same may be varied in many ways. Such variations are not to be regarded as a departure from the spirit and scope of the invention, and all such modifications are intended to be included within the scope of the following claims.

CLAIMS

1. A thermal recording apparatus for recording onto a recording paper comprising:
a printing head;
an ink ribbon member; and
movement means for moving the printing head between a first position in which the printing head is in contact with the recording paper via the ink ribbon member and a second position in which the printing head is not in contact with the recording paper.

2. The thermal recording apparatus of claim 1, further comprising:
carriage carrying the printing head and the ink ribbon member.

3. The thermal recording apparatus of claim 2, wherein the carriage is moved relatively between the first position and the second position.

4. The thermal recording apparatus of claim 2, wherein the carriage is seesawed between the first position and the second position.

5. The thermal recording apparatus of claim 3, wherein the carriage is driven by a cam and motor means for driving the cam.

6. The thermal recording apparatus of claim 5, wherein the cam has a maximum radius area to selected the second position and a minimum radius area to selected the first position.

7. The thermal recording apparatus of claim 2, wherein the carriage comprises ink ribbon reel axis for reeling the ink ribbon member.

8. The thermal recording apparatus of claim 5, wherein the ink ribbon reel axis is slightly rotated in the ribbon reel direction when the carriage is moved from the first position to the second position.

9. The thermal recording apparatus of claim 8, wherein the ink ribbon reel axis is driven by gear means.

10. The thermal recording apparatus of claim 1, further comprising:
second carriage movement means for moving the carriage in the horizontal direction.

11. The thermal recording apparatus of claim 10, wherein the second carriage movement means comprises wire means in which both ends of the wire means are coupled to the carriage and the wire means is looped.

12. The thermal recording apparatus of claim 11, wherein the carriage, further, comprises rotatable pulley means operatively coupled to the ribbon reel axis and the wire means is reeld around the pulley means.

13. The thermal recording apparatus of claim 12, wherein the ink ribbon member is coated by a themomelting material.

14. A printer substantially as herein described with reference to the accompanying drawings.

Printed in the United Kingdom for
Her Majesty's Stationery Office, Dd 8818935, 1985, 4235.
Published at The Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained